

Applicant: Dietmar VAN DER LINDEN et al.
Docket No. R.307220
Preliminary Amendment

AMENDMENTS TO THE SPECIFICATION:

Page 1, please add the following new paragraph before paragraph [0001]:

[0000.2] CROSS REFERENCE TO RELATED APPLICATIONS

[0000.4] This application is a 35 USC 371 application of PCT/DE 2004/002041 filed on September 14, 2004.

[0000.6] BACKGROUND OF THE INVENTION

Please replace paragraph [0001] with the following amended paragraph:

[0001] ~~Prior Art~~ **Field of the Invention**

Please replace paragraph [0002] with the following amended paragraph:

[0002] The invention is ~~based on a valve, in particular~~ **directed to an improved valve** for a high-pressure pump of a fuel injection system for an internal combustion engine, ~~as generically defined by the preamble to claim 1.~~

Please add the following new paragraph before paragraph [0003]:

[0002.5] Description of the Prior Art

Please replace paragraph [0003] with the following amended paragraph:

[0003] A high-pressure pump with ~~such~~ a valve **of the type with which this invention is concerned** is known from German Patent Disclosure DE 197 44 577 A1. This high-pressure pump has a housing in which the valve, embodied as a check valve, is disposed. The valve has a valve member in the form of a ball, which cooperates with a valve seat formed in the housing part in order to open and close a communication of a pump work chamber of the high-pressure pump with a fuel outlet. The valve seat has an at least approximately conical seat face. To achieve sure sealing of the valve seat by the valve member, the shape of the seat

face in terms of roundness and its surface smoothness must be manufactured very precisely. This requires complicated machining of the seat face, for instance by means of grinding. In the known valve, the seat face is large, so that its machining requires a large tool and is time-consuming and under some circumstances leads to the removal of a large amount of material. If the housing part of the high-pressure pump is hardened, the hardened surface layer of the housing part might be removed under some circumstances, and in that case there is no longer adequate strength of the seat face, which is hence subject to severe wear. Furthermore, the flow through the known valve is not optimal, because of the major flow deflection and the attendant flow losses of the seat face.

Page 2, please replace paragraph [0004] with the following amended paragraph:

[0004] ~~Advantages of the Invention~~

SUMMARY AND ADVANTAGES OF THE INVENTION

Please replace paragraph [0005] with the following amended paragraph:

[0005] The valve of the invention ~~having the characteristics of claim 1~~ has the advantage over the prior art that the seat face is markedly stepped by the faces of deviating inclination that adjoin it and is thus easier to machine, is short in length, and requires less removal of material, so that with a hardened housing part, the hardened surface layer is also preserved at the seat face. Moreover, by means of the faces adjoining the seat face, a gradual deflection of the flow is achieved, thus reducing the flow losses.

Please replace paragraph [0006] with the following amended paragraph:

[0006] ~~In the dependent claims, advantageous~~ **Advantageous** features and refinements of the valve of the invention are disclosed, **including** ~~The embodiments according to claims 2 and 3~~ **which** make a further reduction in the size of the seat face possible and hence a simplification of its machining and a further reduction in the flow losses. ~~The embodiment according to claim 4 likewise makes a further reduction in flow losses possible.~~ The high-pressure pump of the invention ~~having the characteristics of claim 7 has the advantage that it is simple to manufacture, and a good flow from its inlet valve and/or outlet valve is attained.~~

Page 3, please replace paragraph [0007] with the following amended paragraph:

[0007] ~~Drawing~~ **BRIEF DESCRIPTION OF THE DRAWINGS**

Please replace paragraph [0008] with the following amended paragraph:

[0008] Further exemplary embodiments of the invention are ~~shown in the drawing and explained further in the ensuing description. Fig. 1 shows a high-pressure pump for a fuel injection system of an internal combustion engine; Fig. 2 shows a valve of the high-pressure pump in an enlarged view of a first exemplary embodiment in the pre-machined state; Fig. 3 shows the valve in a completely machined state; Fig. 4 shows the valve in a second exemplary embodiment in the pre-machined state; Fig. 5 shows the valve in a third exemplary embodiment in the completely machined state; and Fig. 6 shows the valve in a fourth exemplary embodiment in the completely machined state.~~ **described herein below, with reference to the drawings, in which:**

Please add the following new paragraphs before paragraph [0009]:

[0008.2] Fig. 1 shows a high-pressure pump for a fuel injection system of an internal combustion engine;

[0008.4] Fig. 2 shows a valve of the high-pressure pump in an enlarged view of a first exemplary embodiment in the pre-machined state;

[0008.6] Fig. 3 shows the valve in a completely machined state;

[0008.8] Fig. 4 shows the valve in a second exemplary embodiment in the pre-machined state;

[0008.10] Fig. 5 shows the valve in a third exemplary embodiment in the completely machined state; and

[0008.12] Fig 6 shows the valve in a fourth exemplary embodiment in the completely machined state.

Please replace paragraph [0009] with the following amended paragraph:

[0009] ~~Description of the Exemplary Embodiments~~

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Page 5, please replace paragraph [0013] with the following amended paragraph:

[0013] In each of Figs. 2 through 6, a valve of the high-pressure pump is shown enlarged; this may be the inlet valve 28 or the outlet valve 34 of the high-pressure pump. The valve will be described in further detail below in terms of the outlet valve 34. The fuel outlet 32 extends as a bore in the housing 10 of the high-pressure pump; the bore has one portion 32a of small diameter, opening into the pump work chamber 24, and one portion 32b of large diameter,

discharging at the outside of the housing 10. The valve member 35, embodied as a ball, of the valve 34 is located in the bore portion 32. The diameter of the valve member 35 is less than the diameter of the bore portion 32 32b, but greater than the diameter of the bore portion 32a. At the transition between the bore portion 32a, 32b, a valve seat 44 is formed in the housing 10, and the valve member 35 cooperates with it to close and open the fuel outlet 32 from the pump work chamber 24. The valve member 35 is pressed against the valve seat 44 by a closing spring 48, fastened between this valve member and a closure element 46 that closes off the bore portion 32b toward the outside. When the pressure in the pump work chamber 24, which acts on the valve member 35 via the bore portion 32a, generates a greater force against the valve member 35 than the closing spring 48 does, the valve member 35 lifts from the valve seat 44 and opens the fuel outlet. A further bore 50, which communicates with the reservoir 110 via a line, discharges into the bore portion 32b.

Page 9, please add the following new paragraph after paragraph [0017]:

[0018] The foregoing relates to a preferred exemplary embodiment of the invention, it being understood that other variants and embodiments thereof are possible within the spirit and scope of the invention, the latter being defined by the appended claims.